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SAGAR PUBLIC SCHOOL

SAKET NAGAR, BHOPAL

YEAR 2010-11

SAMPLE BOARD EXAMINATION-2

[CLASS XII]

Time: 3 hours **MATHEMATICS(041)** **M.M. 100**

1 mark

Q. 1. Show that modulus function is not one-one.

Q. 2. Evaluate: $\sin\left(\cos^{-1}\frac{3}{5}\right)$.

Q. 3. What is the value of $|2\ I_3|$, where I_3 is the identity matrix of order 3?

Q. 4. For what value of x the matrix $\begin{bmatrix} x & 2 \\ 3 & -1 \end{bmatrix}$ is invertible?

Q. 5. If $A=[a_{ij}]_{2x3}$ and $B=[b_{jk}]_{3x4}$, then what is the order of the matrix $(BA)^T$.

Q. 6. Evaluate : $\int \cos x\sqrt{16-\sin^2 x}\,dx$.

Q. 7. Evaluate : $\int e^x(\tan x-\log\cos)dx$.

Q. 8. If $\vec{a} = 5\hat{i}-\hat{j}-3\hat{k}$ and $\vec{b} = \hat{i}+3\hat{j}-5\hat{k}$, then show that $(\vec{a}+\vec{b})$ is orthogonal to $(\vec{a}-\vec{b})$.

Q. 9. Find a unit vector perpendicular to both $\vec{a} = 2\hat{i}+\hat{j}-2\hat{k}$ and $\vec{b} = 3\hat{i}-\hat{j}+\hat{k}$.

Q. 10. Show that the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ intersect each other.

4 marks

Q. 11. Show that the function f: R $\longrightarrow$ R defined by $f(x) = 2x^3 + 5$, $x \in R$ is bijective.

Q. 12. Prove that $tan^{-1}\frac{3}{7}+tan^{-1}\frac{3}{5}-tan^{-1}\frac{8}{19}=\frac{\pi}{4}$ **"OR"** Solve : $tan^{-1}\left(\frac{1-x}{1-x}\right)=\frac{1}{2}\ tan^{-1}x, (x>0)$

Q. 13. Using properties of determinants, prove that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$ = abc $(1/a + 1/b + 1/c + 1)$.

Q. 14. For what values of a and b the function

$f(x) = \begin{cases} x^2, & if\ x \le 1 \\ 2ax+b, & if\ x>1 \end{cases}$ is differentiable at x=1.

Q. 15. If $x^p\ y^q = (x+y)^{p+q}$, prove that $\frac{dy}{dx}=\frac{y}{x}$. **"OR"**

If $(x-a)^2 + (y-b)^2 = c^2$, prove that $\frac{\left\{1+\left(\frac{dy}{dx}\right)^2\right\}^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$ is a constant, independent of a and b.

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Q. 16. Find the equation of the tangent to the curve y = $\sqrt{3x-2}$ which is paralled to the line 4x – 2y +5 =0. **"OR"**

Find the intervals in which the function f(x) = $\frac{4\sin x - 2x - x\cos x}{2+\cos x}$, $0 \le x \le 2\pi$ is

(i) increasing and (ii) decreasing

Q. 17. $\int \frac{dx}{\cos(x+a)\cos(x+b)}$ **"OR"** $\int \frac{x}{(x+1)(x^2+1)}\,dx$

Q. 18. From the differential equation of all circles, which pass through the origin and whose centre lies on y-axis.

Q. 19. Solve the following differential equation: x cosy dy = ($xe^x \log x + e^x$) dx; y (0) = $\frac{\pi}{6}$.

4 marks

Q. 20. If $\vec{a}+\vec{b}+\vec{c}=0$ and $|\vec{a}|=2,\ |\vec{b}|=3, |\vec{c}|=4$; then find the value of $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$.

Q. 21. Find the shortest distance between the lines $\frac{x-6}{3}=\frac{y-7}{-1}=\frac{z-4}{1}$ and $\frac{x}{-3}=\frac{y+9}{2}=\frac{z-2}{4}$.

Q. 22. A basket contains 5 bananas, 6 apples and 4 oranges. Three fruits are taken one by one without replacement. Find the probability distribution of number of apples drawn.

23. If $A=\begin{bmatrix}2 & 1 & 3\\ 4 & -1 & 0\\ -7 & 2 & 1\end{bmatrix}$, find A^{-1} and hence solve the following system of equations :

2x + y + 3z = 3; 4x – y = 3; -7x + 2y + z = 2.

24. Evaluate : $\int_1^2 (x^2+x+2)dx$ as a limit of sums. or Evaluate: $\int_0^1 \sin^{-1}(x\sqrt{1-x}-\sqrt{x}\sqrt{1-x^2})dx$

25. A given quantity of metal is to be cast into half circular cylinder (i.e., with rectangular base and semicircular ends). Show that in order that the total surface area may be minimum, the ratio of the cylinder to the diameter of its circular ends is π : (π + 2).

26. Find the equation of the plane passing through the intersection of the planes 2x + 3y – z + 1 = 0; x + y – 2z + 3 = 0 and perpendicular to the plane 3x – y – 2z – 4 = 0. Also find the inclination of this plane with the xy-plane.

6 marks

27. Find the ratio of the areas into which the curve $y^2 = 6x$ divides the region bounded by $x^2 + y^2 = 16$.

28. A fair die is rolled. If 1 turns up, a ball is picked up at random from bag A, if 2 or 3 turns up, a ball is picked up at random from bag B, otherwise a ball is picked up from bag C. Bag A contains 3 red and 2 white balls, bag B contains 3 red and 4 white balls and bag C contains 4 red and 5 white balls. The die

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is rolled, a bag is picked up and a ball is drawn from it. If the ball drawn is red, what is the probability that bag B was picked up?

29. A catering agency has two kitchen to prepare food at two places A and B. From these places 'Mid-day Meal' is to be supplied to three different schools situated at P,Q,R. the monthly requirements of the schools are respectively 40,40 and 50 food packets. A packet contains lunch for 1000 students. Preparing capacity of kitchens A and B are 60 and 70 packets per month respectively. The transportation cost per packet from the kitchens to schools is given below:

Transportation cost per packet (in Rs)		
To	From	
	A	B
P	5	4
Q	4	2
R	3	5

How many packets from each kitchen should be transported to school so that the cost of transportation is minimum? Also find the minimum cost.

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